

Section 9-7 Function of a Random Variable

You take a 6 question multiple choice test that has answers A, B, C, D. (exactly one answer is correct)

- a. What is the probability that your answer on a particular problem is correct? $\frac{1}{4}$
- b. What is the probability that your answer is wrong? $\frac{3}{4}$
- c. If you guess at random what is the probability that you will get 2 answers correct?

$\frac{1}{4} * \frac{1}{4} * \frac{3}{4} * \frac{3}{4} * \frac{3}{4} * \frac{3}{4}$ * but how many groups of 2 right are there?
 * only 1 group of 2 right

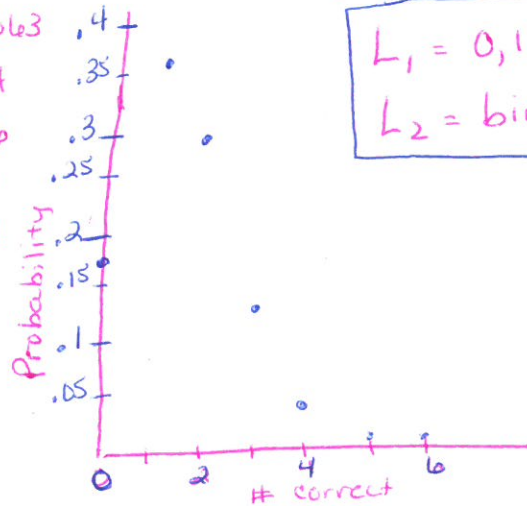
Binomial Probability Distribution (function) $P(x) = {}_n C_x \cdot a^{n-x} \cdot b^x$
 b is the probability that the event will occur in any one trial
 a is the probability that the event will NOT occur in any one trial
 x is the number of times the event occurs in "n" repetitions

- d. Find all terms in the probability distribution.

$P(0) = {}_6 C_0 \cdot 0.75^6 \cdot 0.25^0 = .17798$
 $P(1) = {}_6 C_1 \cdot 0.75^5 \cdot 0.25^1 = .35596$
 $P(2) = {}_6 C_2 \cdot 0.75^4 \cdot 0.25^2 = .29663$
 $P(3) = {}_6 C_3 \cdot 0.75^3 \cdot 0.25^3 = .13184$
 $P(4) = {}_6 C_4 \cdot 0.75^2 \cdot 0.25^4 = .03296$
 $P(5) = {}_6 C_5 \cdot 0.75^1 \cdot 0.25^5 = .00439$
 $P(6) = {}_6 C_6 \cdot 0.75^0 \cdot 0.25^6 = .00024$

- e. Plot the graph of the probability distribution.

on calc



binompdf = 2nd VARS → 0
 ↪ (# attempts, % , # occurrences)

(6, .25, L1)

L1 = 0, 1, 2, etc.
 L2 = binompdf

- f. What is the probability you get at least 4 questions correct?

$P(4) + P(5) + P(6)$

$.03759$

- g. What is the probability you get less than 4 questions correct?

$P(0) + P(1) + P(2) + P(3)$

$1 - .03759 = .96241$

OR $1 - \text{answer from f}$

Pascal's Triangle

										row 0
										row 1
										row 2
										row 3
										row 4
										row 5
										row 6
										row 7

Binomial Expansion

$$\begin{aligned}
 (a + b)^0 &= 1 \\
 (a + b)^1 &= a + b \\
 (a + b)^2 &= a^2 + 2ab + b^2 \\
 (a + b)^3 &= a^3 + 3a^2b + 3ab^2 + b^3 \\
 (a + b)^4 &= a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4 \\
 (a + b)^5 &= a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5
 \end{aligned}$$

* notice coefficients of the terms.
 * notice progression of exponents

Extra Example:

The probability of Carter scoring a free-throw is 85%. He has 8 attempts.

.0185
 .08386
 .2376
 .38469
 .27249

binompdf (8, .85, L1)

a. Find the probability of Carter scoring 5 free-throws.

$$P(5) = {}_8C_5 * .85^5 * .15^3 = \boxed{.08386}$$

b. Find the probability of Carter scoring at least 6 free-throws.

$${}_8C_6 * .85^6 * .15^2 + {}_8C_7 * .85^7 * .15^1 + {}_8C_8 * .85^8 * .15^0 = \boxed{.8948}$$

$P(6) + P(7) + P(8) \Rightarrow$ on clear screen

c. Find the probability he scores less than 4 free-throws.

$$\begin{aligned}
 &{}_8C_3 * .85^3 * .15^5 + {}_8C_2 * .85^2 * .15^6 + {}_8C_1 * .85^1 * .15^7 \\
 &+ {}_8C_0 * .85^0 * .15^8 = \boxed{.00285}
 \end{aligned}$$

d. Prob. that he scores less than 6.

$$1 - \text{answer from b} = \boxed{.1052}$$

* notice progression of exponents
 * all terms part of binomial expansion
 $(.85 + .15)^8$